Advances in the Prevention and Treatment of Spinal Surgical Site Infections

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Abstract

Surgical site infections are a significant postoperative complication of spinal surgery, with an incidence ranging from 1% to 9%. The Centers for Disease Control and Prevention defines a surgical site infection as an infection related to surgery that occurs within one year of the procedure and leads to a deep soft tissue infection at the incision site. Surgery-related infection occurs within one year of surgery, affecting the deep soft tissues of the incision. It is characterized by at least one of the following: 1) drainage of pus from the deep incision; 2) natural fissure or Pus discharge from the deep incision; 3) natural fissure or purulent discharge from the incision, accompanied by fever and localized pain; 4) surgical exploration or imaging examinations indicating deep soft tissue infections. Surgical exploration or imaging examination revealed a deep abscess; 5) clinicians based on clinical evidence diagnosed deep incision infection deep incisional infection diagnosed by clinicians based on clinical evidence. Spinal surgical site infections prolong treatment time, increase treatment costs, and can even raise mortality rates. Therefore, it is crucial to prevent spinal surgical infections to ensure medical safety.

Keywords

Surgical site infections, Risk factors, Review literature, Bacterial infections

Surgical site infections are a serious postoperative complication of the spine with an incidence of 1% to 9%. The Centers for Disease Control and Prevention defines a surgical site infection as a surgical-related infection that occurs within 1 year of surgery and results in a deep soft tissue infection of the incision. Surgery-related infection that occurs within 1 year of surgery and results in an infection of the deep soft tissues of the incision, and Has at least one of the following: 1) drainage of pus from the deep incision; 2) natural fissure or Pus discharge from the deep incision; 3) natural fissure or purulent discharge from the incision, combined with fever and localized pain; 4) surgical exploration or imaging examination reveals a combination of deep soft tissue infections. Surgical exploration or imaging examination found to be combined with deep abscess; 5) clinicians based on clinical evidence diagnosed deep incision infection deep incisional infection diagnosed by clinicians based on clinical evidence [1]. Infection at the spinal surgical site can lead to spinal instability, aggravation of nerve damage, and centralization of the spine. spinal instability, aggravation of nerve damage, central nervous system infection, and even endanger the patient's life. It also prolongs hospitalization time and increases treatment costs [2]. The author aims to study the progress of prevention and treatment of spinal surgical site infections. The author aims to summarize the progress of research on the prevention and treatment of spinal surgical site infections and reports as follows.

1. Risk factors for spinal surgical site infections

Patient-related risk factors: patient age >60 years, severe endocrine metabolic disease, comorbid cardiovascular disease, obesity, long-term smoking, tumor, long-term Xie disease, combined cardiovascular and cerebrovascular
diseases, obesity, long-term smoking, malignant tumors, long-term application of steroid hormones, poor nutritional status, chronic respiratory diseases, long-term application of immunosuppressive drugs [3]. Risk factors associated with surgery: prolonged operation time, high intraoperative blood loss, intraoperative blood transfusion, placement of internal fixation devices, multisegmental surgery, prolonged hospitalization, revision surgery, and multiple surgeries. The incidence of spinal surgical infections after the placement of internal fixation devices has been reported in the literature to increase to 6%-18% [4]. The incidence of infection in transabdominal and transthoracic spine surgeries is higher than that in The higher incidence of infection in transabdominal and transthoracic spine surgery is mainly due to the migration of bacteria through the peritoneum and pleura [5]. The higher incidence of transabdominal and transthoracic spinal surgery is mainly due to the migration of bacteria through the peritoneum and pleura [5].

2. Characterization of flora in spinal surgical site infections

The most common bacterial infections at the surgical site of the spine are Staphylococcus aureus, coagulase-negative staphylococci, streptococci, and Escherichia coli, while the fungi causing spinal infections are mainly Aspergillus spp, Candida spp, and Cryptococcus neoformans. A report from the International Scoliosis Research Society stated that 1.2% of 47,755 spinal surgeries resulted in postoperative surgical site infections, and the most common pathogens were Staphylococcus aureus (41.9%) and methicillin-resistant Staphylococcus aureus (17.0%) [6]. Long et al. [7] investigated 351 infections occurring within 90 d of spinal surgery and found that the location of surgical site infections was related to the location and type of the infection, and the location of the infection was related to the location and type of the spinal surgery. There was an anatomical gradient between the location of spinal surgical site infections and the species of infecting microorganisms. The anatomical gradient between the location of spinal surgical site infections and the species of infecting microorganisms, transitioning from the cervical spine's gram-positive flora to the lumbosacral region's gram-negative cephalosporin-resistant Gram-negative organisms were found to be Cephalosporin-resistant Gram-negative infections are common in the lumbosacral segments, and methicillin-resistant infections are common in the cervical spine. Cephalosporin-resistant infections are common in cervical segments and methicillin-resistant in cervical segments. There is a direct correlation between the site of surgery and the type of bacterial infection. The surgical site is directly related to the type of infecting bacteria, which allows for individualized, selective, and empirical application of antibiotics. Zhou Jiaming et al. [8] conducted a meta-analysis of 603 spinal surgeries in 27 studies, and the number of neuromuscular highest incidence of postoperative surgical site infections was found in the cervical spine (13.0%) in neuromuscular type scoliosis. The incidence of surgical site infections in the cervical, thoracic, and lumbar spine was 3.4%, 3.7%, and 2.7%, respectively; the incidence of surgical site infections in the posterior spine was 5.0%. The incidence of infection was 5.0% for posterior surgery and 2.7% for anterior surgery; the incidence of infection in patients undergoing minimally invasive spinal surgery was 5.0%. The incidence of infection in minimally invasive spinal surgery patients (1.5%) was significantly lower than that in open surgery patients (3.8%). Abdul-Jabbar et al. [9] found that revision spine surgery was more likely to be infected than primary spine surgery (47.8%). Abdul-Jabbar et al. [9] found that revision spine surgery was more likely to be infected than primary spine surgery (47.4% vs. 28.0%, P=0.003). Although the current clinical ability to trace pathogenic bacteria has been significantly improved, nearly one-third of the specimens submitted for false negatives in specimens sent for testing. The most common organisms involved in spinal surgical site infections are still gram-positive bacteria. remained Gram-positive, but the number of Gram-negative infections also increased, and the number of mixed infections with multiple pathogenic organisms increased, and the proportion of mixed infections with multiple pathogenic microorganisms is also increasing. It is noteworthy that methicillin-resistant the proportion of spinal surgical site infections caused by methicillin-resistant Staphylococcus aureus is as high as 19%. Lewkonia et al. [10] investigated the incidence of surgical site infections in patients after spinal surgery in the United States and Canada. patients who developed surgical site infections, most of the patients' infections occurred within 3 months after surgery, and only 4.3% occurred 6 months after surgery, and more than one-third of the patients had methicillin-resistant gold. More than one-third of the patients had methicillin-resistant Staphylococcus aureus infections.

3. Pre-surgical screening and prophylactic antibiotics for spinal surgery

Preoperative nasal bacterial colonization is closely related to postoperative spinal surgical site infections, and bacteria in the nasal cavity may lead to surgical site infections through dissemination in the postoperative period [11-13]. Tomov et al. [14] gave a preventive protocol by screening all patients for methicillin-sensitive and methicillin-resistant...
resistant Staphylococcus aureus through nasal swabs, and patients with a positive screening were coated with mupirocin ointment in the nasal cavity. Anderson et al. [15] found by retrospective analysis that the probability of endogenous bacterial infection could be reduced by preoperative screening for species of bacterial colonization and bacterial decolonization based on the screening results. At the same time, the timing of preoperative drug administration is equally important in reducing the risk of developing spinal surgical site infections. Malhotra et al. [16] studied and analyzed 46,791 hospitalized patients, and showed that only 36.1% of the patients were correctly infused with vancomycin within the prescribed 60-120 min prior to incision of the skin and that the infusion time for cefazolin was (19.66±15.78) min prior to incision of the skin. The likelihood of cefazolin meeting the standard infusion time was significantly higher than that of vancomycin; logistic regression analysis revealed that only the infusion of antibiotics 24.6 min before skin incision could effectively reduce the probability of spinal surgical site infection. The need for prophylactic antibiotics in patients without internal fixation remains controversial. Shawky et al. [17] classified spinal surgery patients without internal fixation under clean incision, the first group of patients was given antibiotic treatment routinely (intravenous or oral antibiotics until the incision was removed), and the second group of patients were only given intravenous antibiotic treatment for 1d. The results showed that the incidence of surgical site infections between the two groups differed significantly. The difference in the incidence of surgical site infection between the two groups was found to be not statistically significant, and it was concluded that only 1d of postoperative prophylactic antibiotics was needed in the absence of internal fixation placement. prophylactic antibiotic application for 1d after surgery without internal fixation placement.

4. Route and cycle of postoperative antibiotic administration

Intravenous infusion of antibiotics is preferred to oral administration, and most literature recommends that antibiotics should be. Most of literature recommends that antibiotics should be used for 6 to 12 weeks. Bacterial resistance due to antibiotic misuse has been shown in clinical practice, and Gurusamy et al. [18] found that imipenem and vancomycin have the widest bacterial coverage at present. It is worth noting that drug-resistant flora are constantly evolving, and previous empirical medication has lost its sensitivity, clinicians must adjust the medication according to the results of bacterial culture and drug sensitivity tests. Pavoni et al. [19] carried out a case study on the non-surgical treatment of infections after internal fixation, and the 20 cases who were given intravenous infusion in the first stage as well as oral antibiotics in the second stage were eventually cured, and the duration of antibiotics was 12-64 weeks. The duration of antibiotic treatment ranged from 12 to 64 weeks, and it was concluded that oral and intravenous antibiotics were equally effective in the treatment of infections. Yin et al. [20] concluded that oral antibiotic treatment for 3 months was required based on the results of the pathogenetic cultures. Haimoto et al. [21] reported that children <6 years of age required more than 6 weeks of antibiotic treatment. Haimoto et al. [21] reported that children <6 years of age required more than 6 weeks of antibiotic treatment.

5. Conclusion

In summary, preoperative prevention of spinal surgical site infections requires screening for bacterial colonization according to the surgical site and surgical procedure, and selecting appropriate antibiotics for prophylactic application. Intraoperative antibiotic infusion needs to control the exact time and the exact infusion rate. Intraoperative topical vancomycin can reduce the incidence of spinal surgical site infections, but it may cause Gramoxicosis, but may result in an increased incidence of gram-negative and mixed bacterial infections and mixed bacterial infections. For patients with confirmed spinal surgical site infections, obtain a clear bacterial culture and administer the full dose of vancomycin. For patients with confirmed spinal surgical site infections, the key to treatment is to obtain a clear bacterial culture and apply antibiotics in adequate amounts and throughout the course of treatment.

References


